MX-62-227A

PRELIMINARY TECHNICAL MANUAL

OPERATION INSTRUCTIONS

RADIO SET AN/URC-98

(USED IN COMMUNICATIONS CENTRALS 106E-2A AND AN/MRC-107A FOR HAVE QUICK II MODIFICATION)

AND

RADIO SET AN/URC-99

(USED IN COMMUNICATIONS CENTRALS AN/MRC-108() FOR HAVE QUICK II MODIFICATION)

Magnavox Electronic Systems Company
Contract No. F19628-84-C-0084

This Technical Manual supersedes TO 12R2-2URC-101-1, dated 1 April 1986 and TO 12R2-2URC-101-2, dated 1 April 1986.

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INTRODUCTION

This Operation Instructions manual has been prepared under the following military technical manual specifications:

MIL-M-38798B (USAF) Technical Manuals: Operation Instructions, Maintenance Instructions, Circuit Diagrams, Alignment Procedures, and Installation Planning.

MIL-M-38784B Technical Manuals: General Style and Format Requirements.

The manual has operating instructions for RT-1504 (remote-controlled) radio set (RT's) and radio set controls C-11721 and C-11816. The manual is divided into two chapters: Chapter 1 - General Information, and Chapter 2 - Operation. Chapter 2 explains operation instructions sufficiently to the level required by an operator of the system.

Non-standard abbreviations used in this publication and their definitions are listed below. Refer to MIL-STD-12D for any standard abbreviations used in this manual.

Abbreviation	Definition
ANVIS	Aviators Night Vision Imaging System
CNG	Change
COMSEC	Communications Security
EEPROM	Electrically-Eraseable Programmable Read Only Memory
FMT	Frequency Management Training
F/S	Frequency/Status
GRD	GUARD
LRU	Line Replaceable Unit
M-P-G	MNL-PRESET-GRD
MWOD	Multiple Word-of-Day
SQ	Squelch
TOD	Time-of-Day
WOD	Word-of-Day

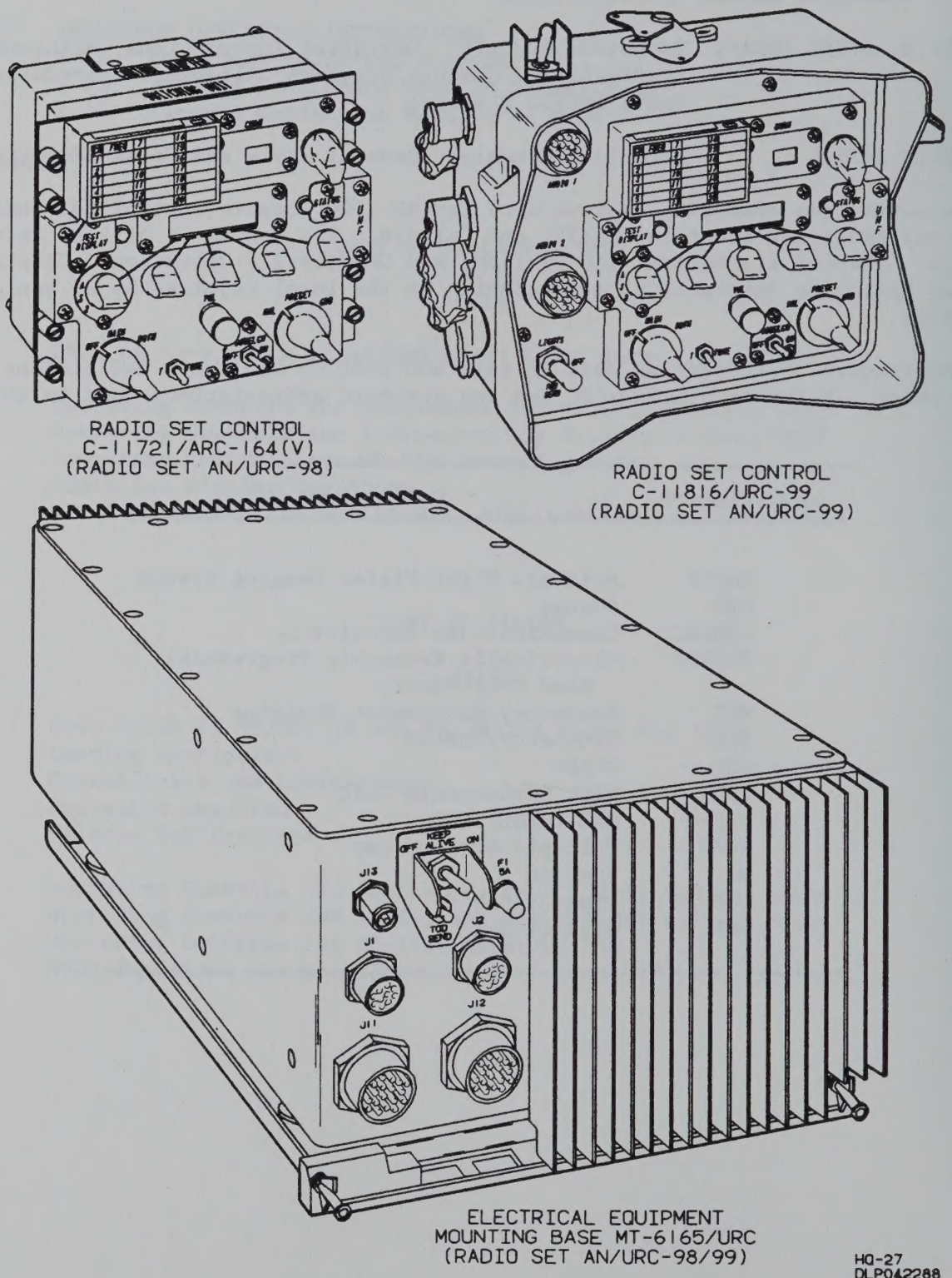

Figure 1-1. LRUs of Have Quick II AN/URC-98/99 Radio Sets

CHAPTER 1

GENERAL INFORMATION

1-1 DESCRIPTION.

The Have Quick II AN/URC-98 and AN/URC-99 radio sets consist of the Line Replaceable Units (LRUs) shown in figure 1-1 and listed in table 1-1. The Have Quick II AN/URC-98 UHF radio set is used in Communications Centrals AN/MRC-107A and 106E-2A and utilizes the C-11721 control unit. The Have Quick II AN/URC-99 UHF radio set is used in Communications Centrals AN/MRC-108() and utilizes the C-11816 control unit. The remote receiver-transmitter RT-1504 and mounting base MT-6165 LRUs are common to both radio sets.

Table 1-1. Have Quick II AN/URC-98 and AN/URC-99 Radio Set LRUs

Line replaceable unit	Description/Application/Part number
C-11721/ARC-164(V)	UHF Control for AN/MRC-107A Comm. Central 900116-806
C-11816/URC-99	UHF Control for AN/MRC-108() Comm. Central 900168-801 (red panel lighting) 900168-802 (NVG panel lighting)
RT-1504/ARC-164(V)	Remote Mount UHF Receiver-Transmitter (RT) 707650-801
MT-6165/URC	Mounting Base for UHF RT 707005-801

1-2 PURPOSE OF EQUIPMENT.

The radio set is designed to provide normal and jam-resistant (anti-jam or AJ) air-to-ground or ground-to-ground voice communications in the 225.000 MHz to 399.975 MHz UHF military band on 7000 separate channels. In a communications-jamming environment, the AJ mode enables the radio set to operate with other radios that are similarly equipped with the Have Quick AJ capability.

1-3 EQUIPMENT CHARACTERISTICS.

The Have Quick II AN/URC-98/99 radio sets provide a 7000 channel UHF tuneable receiver; an auxiliary guard receiver (nominally 243.000 MHz) and a 7000 channel, 10-watt carrier transmitter for normal AM voice and AJ mode communications. The Have Quick II radio set provides additional AJ improvements and features over the original Have Quick radio set as follows:

a. Two new frequency tables (NATO/Europe and non-NATO/Europe) and reserved memory space for a fourth frequency table in addition to the original A-net and B-net frequency table.

b. Multiple Word-of-Day (MWOD) loading capability which allows entry of up to six WODs for six days use.

c. Provides a connector to interface an electronic fill device for automatic MWOD loading.

d. MWOD erase capability.

e. Provides an expanded training net (Frequency Management Training net or FMT-net) in addition to the present T-net. FMT-net operation permits all users to share a common training WOD yet also provides the capability for regional allocation of the FMT-net frequency hopset (16 frequencies).

f. Addition of operational date information as part of Time-of-Day (TOD) message. This allows the radio set to initialize with the proper WOD.

g. Front panel liquid-crystal displays for channel and frequency information as well as other operator prompts.

h. Provides ANVIS green-A compatible front panel lighting for use with night vision goggle (NVG) equipment.

1-3.1 AJ Capability. The AJ mode of operation provides jam-resistant capability by taking advantage of the rapid tuning ability of the radio set. Automatically changing the frequency many times per second is a technique called frequency-hopping. To permit frequency-hopping, three special entries are required. These entries are word-of-day (WOD), time-of-day (TOD) and net number.

1-3.2 WOD. This programs the frequency-hopping rate and frequency-hopping pattern. The radio cannot function in the AJ mode without a valid WOD. In the Have Quick II radio set, the WOD data is now stored in non-volatile memory located in the receiver-transmitter SYNTHESIZER/ECCM assembly. Preset channels previously reserved for WOD storage (19 - 15) can now be used for normal preset operation, since the WOD does not take up preset memory. The WOD memory is still accessed through preset channel locations 20 through 14. WOD length may vary and may require anywhere from one to six channel locations (20 - 15). The seventh memory location (accessed by channel 14) stores day-of-month information. This date code works in conjunction with TOD and specifies which day the WOD is to be utilized. At midnight transitions, the radio set automatically generates a new frequency-hop pattern based on the new day's WOD. Up to six WODs may be entered at one time, allowing for multi-day use of the radio set without installing another WOD. This procedure for

loading multiple WODs is called MWOD loading. The radio set retains the six most recently entered WODs. If a WOD is entered having a duplicate date as one previously entered, the new entry takes precedence and is identified as being the most recent entry. The radio set also has the capability to erase all stored MWODs.

1-3.3 TOD. TOD synchronization is necessary for communicating in the AJ mode. The TOD signal synchronizes all radios in the system using the same WOD so they can frequency-hop at the same instant in time. In the Have Quick II radio set, operational date information is added to the end of the TOD message. This information is necessary so the radio set can select the WOD with the same date. The radio set automatically accepts the first TOD signal received after power-up. Subsequent transmissions of TOD are ignored unless the operator enables the radio to receive a new TOD. The operator may also send TOD contained in radio to other radios similarly equipped.

1-3.4 Net Numbers. The net number is used in the AJ mode in the same fashion as a non-AJ mode frequency. The net number enables multiple station pairs to operate simultaneously on a non-interfering basis in the AJ mode while sharing a common WOD and TOD. The net number begins with an "A" and is followed by three digits "000" to "999". The last two digits of the display (00, 25, 50, 75) designate the frequency table being used. This permits 1000 possible net numbers for each frequency table. Net numbers ending in "00" select the original A-net and B-net frequency table. Net numbers ending in "25" select the NATO/Europe frequency table and net numbers ending in "50" select the non-NATO/Europe frequency table. Net numbers ending in "75" are reserved for future use at this time and will generate an invalid net alarm (pulsating warning tone). TRAINING MODE net numbers are designated as listed below. Selecting any other net number while operating on a TRAINING MODE WOD also generates the invalid net alarm.

A00000 through A00400 - Five original T-net numbers
A00025 through A01525 - Sixteen new FMT-net numbers

1-4 LEADING PARTICULARS.

Leading particulars of the Have Quick II AN/URC-98/99 radio sets are listed in table 1-2.

1-5 CAPABILITIES AND LIMITATIONS.

Capabilities and limitations of the Have Quick II AN/URC-98/99 radio sets are listed in table 1-3.

1-6 EQUIPMENT SUPPLIED.

Equipment supplied for the Have Quick II AN/URC-98/99 radio sets is listed in table 1-4.

1-7 RELATED PUBLICATIONS.

Related publications on the Have Quick II AN/URC-98/99 radio sets are listed in table 1-5.

Table 1-2. Leading Particulars

Characteristic	Description
External Interfaces:	
Communications Systems	Communications Centrals AN/MRC-107A and 106E-2A (AN/URC-98) Communications Central AN/MRC-108() (AN/URC-99)
Audio Interface Sets	Handsets H-33, H-138 or Control Group AN/GRA-6
UHF Antennas	AS-1866/MRC-107 (URC-98) and AS-1404/PRC (URC-99) Receive Impedance - 52 ohms Transmit Impedance - 50 ohms
Secure Speech Equipment	TSEC/KY-58, TSEC/KY-57, TSEC/KY-28 (TSEC/KY-28 in normal mode only) and other related VINSON COMSEC equipment.
Keyfill Device	KYK-13/TSEC
External Speaker/Amplifier	76F-3 or equivalent
Operating Temperature Range	-54 degrees C to +55 degrees C (will operate for 30 minute intervals at +71 degrees C).
Non-Operating Temperature Range	-62 degrees C to +85 degrees C
Altitude	15,000 ft (4.57 km) maximum
Humidity	Up to 100% (including condensation on and in the equipment in temperatures up to +50 degrees C).
Moisture	The C-11721 control and MT-6165 mounting base are rainproof. The C-11816/URC-99 control is watertight to a depth of three feet.
Vibration	5 g's at 2000 Hz
Shock	15 g's at 11 milliseconds duration (URC-98) 30 g's at 11 milliseconds duration (URC-99)
Crash Safety	30 g's at 11 milliseconds duration (URC-98) 60 g's at 6 milliseconds duration (URC-99)
Main Receiver Reception Types	AM voice and DF tone AM narrowband data (baseband)
Guard Receiver	Fixed tuned crystal controlled UHF receiver

Table 1-2. Leading Particulars - CONT

Characteristic	Description
Guard Receiver Reception Types	AM voice and AM tone RF
Guard Frequency	243.000 MHz (tuneable from 238.0 to 248.0 MHz)
Transmitter Transmission Types	AM voice and DF tone AM narrowband (baseband) data
Time Keeping Accuracy	Maintains time to +/-3 msec for one week without an update.
Warmup Time	Meets all operating requirements within 10.0 seconds after turn on. Internal rubidium oscillator requires approximately 10 minutes to reach normal operating temperature. Control displays require 3 minute warm-up time at -54 degrees C.
Operating Voltage	18 to 32 Vdc (with transient protection for up to 600 Vdc from 0 to 10 microseconds). 24 to 32 Vdc (Service Condition) 18 to 24 Vdc (Emergency Condition)
Power Consumption:	
MT-6165/URC (with RT-1504/ ARC-164(V) installed)	Receive - 105 watts Transmit - 240 watts
Radio Set Controls	20 watts
Physical Dimensions:	
MT-6165/URC (with RT-1504/ ARC-164(V) installed)	Width - 9.51 in. (24.16 cm) Height - 7.08 in. (17.97 cm) Depth* - 16.94 in. (43.03 cm) Weight - 35.50 lb. (16.08 kg)
C-11721/ARC-164(V)	Width - 5.75 in. (14.61 cm) Height - 4.875 in. (12.38 cm) Depth* - 5.34 in. (13.56 cm) Weight - 4.32 lb. (1.96 kg)
C-11816/URC-99	Width - 7.50 in. (19.05 cm) Height - 6.25 in. (15.88 cm) Depth* - 5.34 in. (13.56 cm) Weight - 5.31 lb. (2.41 kg)

* Depth dimension includes projecting controls and connectors.

Table 1-3. Capabilities and Limitations

Characteristic	Description
RADIO SET CHARACTERISTICS:	
UHF Antenna	Transmit Impedance - 50 ohm Receive Impedance - 52 ohm
AM Voice and Tone Frequencies	225.000 MHz to 399.975 MHz
Tuning Capabilities	7000 channels
Channel Spacing	0.025 MHz (25 kHz)
Preset Channels	19 available for Normal mode presets. Channel 20 is reserved for mode selection.
Memory Type	CMOS RAM, NMOS EPROM, NMOS EEPROM
Secure Speech Capability	Baseband mode
RF Power Output	10 watts unmodulated output
Spectral Containment	99% +/-12.5 kHz of the carrier frequency
Intercommunication Set Termination	150 ohms +/-30% input impedance 600 ohm X-mode input impedance
Operating Modes	AM Voice Tone Secure Speech (KY-57/58 only in AJ mode) AJ
Receive Signal Sensitivity	Receives AM signals at levels between -101 dBm to +2 dBm
Alignment and Adjustment	None at organizational level, minimal at intermediate level
TOD Transfer Modes	UHF rf link and hardwire link in both Normal and AJ operating modes.
X-Mode Input Impedance	600 +/-20% resistive impedance
Reverse Polarity Protection	Protects circuitry from inadvertent connection to a dc power source of wrong polarity

Table 1-3. Capabilities and Limitations - CONT

Characteristic	Description
Operating Voltage	18 to 32 Vdc (with transient protection for up to 600 Vdc from 0 to 10 microseconds). 24 to 32 Vdc (Service Condition) 18 to 24 Vdc (Emergency Condition)
ENVIRONMENTAL CONDITIONS:	
Operating Temperature Range	-54 degrees C to +55 degrees C (will operate for 30 minute intervals at +71 degrees C).
Non-Operating Temperature Range	-62 degrees C to +85 degrees C
Thermal Shock	Withstands temperature gradient of one degree per second from -62 degrees C to +85 degrees C.
Altitude	Sea level to 15,000 ft. (4.57 km) maximum.
Humidity	Up to 100% (including condensation on and in the equipment in temperatures up to +50 degrees C).
Moisture	Rainproof (all LRUs) and watertight to a depth of three feet (C-11816/URC-99 control only).
RECEIVE CAPABILITIES:	
Types of Reception	AM voice and tone AM narrowband data (baseband)
Audio Outputs	Voice - Ungrounded 150 ohm or 600 ohm narrowband impedance (selectable) X-mode - 500 ohm impedance
Sensitivity	4 microvolts (hard) for 10 dB (S+N)/N at 30% modulation at 1 kHz
Audio Frequency Response	Voice - +1, -3 dB of audio output X-mode - +/-3 dB (70 Hz to 20 kHz) Baseband - +/-3 dB (20 Hz to 12 kHz)
Audio Distortion	10% maximum
Audio Output Power Levels	Voice - 200 mW minimum not to exceed 360 mW (test) X-mode - 2.00 Vrms across 500 ohms (rf input of 1000 microvolts modulated 90% at 1 kHz)

Table 1-3. Capabilities and Limitations - CONT

Characteristic	Description
AGC	At 1000 microvolts antenna input modulated 30% at 1000 Hz, audio output variance is +5 dB/-4 dB from 4 microvolts to 0.5 Volts
Squelch Sensitivity	Carrier-to-noise ratio type, opens at signal level of 4 microvolts or less: Attack time: 50 ms max. (at 90% of steady state ON level) Release time: 150 ms max. (at 10% of steady state ON level)
Input Impedance	Creates SWR of less than 2.5:1 on a 52 ohm transmission line
CLIMAX Compatibility Squelch	Squelch based on carrier-to-noise ratio for signals below -87 dBm +/-6 dB; Squelch based on AGC for signals above -87 dBm +/-6 dB
Selectivity	Narrowband - 6 dB down from nominal frequency for frequencies 12 kHz from nominal; - 40 dB down from nominal frequency for frequencies 25 kHz from nominal
Vibration Modulation	2 dB maximum variation in output due to vibration
GUARD RECEIVE CAPABILITIES:	
Type	Fixed tuned crystal controlled UHF AM receiver
Frequency	Pre-adjusted 243.000 nominal operating frequency; adjustable from 238.000 MHz to 248.000 MHz
Frequency Accuracy	+/- 7.5 kHz
Audio Output	Common with main receiver, within +/-2 dB of main receiver
Speech Security Output	Isolated from main receiver; terminated in 600 ohm load
Selectivity	6 dB down from nominal frequency for frequencies 30 kHz from nominal; 60 dB down from nominal frequency for frequencies 80 kHz from nominal

Table 1-3. Capabilities and Limitations - CONT

Characteristic	Description
TRANSMIT CAPABILITIES:	
Types of Transmission	AM voice and tone AM narrowband data (baseband)
Output Power Level	10 watts (unmodulated output)
AM Modulation	At 1000 Hz and 0.7 Vrms input, negative and positive modulation = 80% minimum
Carrier Distortion	10% maximum between 300 and 3500 Hz at ≤50% or 0.5 Vrms modulation
Carrier Noise Level	Greater than 40 dB below detected audio from carrier modulated 80% positive at 1000 Hz
Modulator Input Impedance	150 ohms +/-30%
Transmitter Rise Time	90% rf power in 70 +/-10 ms (normal mode); no power output between 0 to 40 ms
Sidetone Output Level	At 0.7 Vrms transmit audio input voltage, greater than 100 mW sidetone output
Sidetone Distortion	15% maximum between 300 and 3500 Hz at ≤50% or 0.5 Vrms modulation audio input
Tone Modulation	At 1020 Hz, positive/negative modulation is 80% minimum
Frequency Deviation	Less than 500 Hz from nominal frequency
Peak Frequency Deviation	Less than 2.0 kHz at 1000 Hz with 80% positive modulation
Frequency Hop Settle Time	Within 2 kHz of center frequency in 7.5 msec
CONTROL UNIT CAPABILITIES:	
Clock Frequency	620 Hz +/-20%
Clock Format	32 pulses followed by blank period equaling 8 clock pulses
Clock Phasing	Clock + and clock - are 180 degrees out of phase
Clock Output Levels	2.4 volts minimum for HI state, 0.8 volts maximum for LO state

Table 1-3. Capabilities and Limitations - CONT

Characteristic	Description
Data Format	32 data pulses followed by blank period equaling 8 clock pulses
Data Phasing	Data + and data - are 180 degrees out of phase
Data Output Levels	2.4 volts minimum for HI state, 0.8 volts maximum for LO state
Data Bit Identification	All data bits are negative logic, except bits 14 through 27 which are positive logic

Table 1-4. Equipment Supplied

Nomenclature/ common name	Description and Purpose
Receiver-Transmitter RT-1504/ARC-164(V)	Provides the receive and transmit capabilities in both the normal and AJ operating modes for the radio set.
Signal Data Converter CV-3297/ARC-164(V)	Front slice of remote mount RT. Provides the necessary interface, through system wiring, between the RT, mounting base, control unit and other UHF communications system components.
Synthesizer/ECCM O-1793B/ARC-164(V)	The synthesizer (SYNTH/ECCM) slice generates the required injection frequencies for transmitting and receiving on the selected frequency in both normal and AJ operating modes. The tuning frequencies, receiver gain and squelch control, and normal or AJ functions are generated in response to control unit switch settings. Word-of-day and time-of-day processing also occurs in the SYNTH/ECCM slice.
Guard Receiver R-1976/ARC-164(V)	Allows monitoring of the emergency guard channel. The guard receiver is a superhetrodyne receiver tuned to the emergency channel frequency of 243.000 MHz. The receiver can receive emergency broadcasts while the main receiver is tuned to a different frequency. The guard receiver is turned on and off from the switching unit.

Table 1-4. Equipment Supplied - CONT

Nomenclature/ common name	Description and purpose
Main Receiver R-1977A/ARC-164(V)	The main receiver is tuneable to any one of 7000 channels in 25 kHz increments in the frequency range of 225.000 to 399.975 MHz. When a frequency is selected at the switching unit, the SYNTH/ECCM slice automatically tunes the receiver to the selected frequency. The receiver provides normal AM voice as well as baseband data reception.
Transmitter T-1307A/ARC-164(V)	The transmitter is tuneable to any one of 7000 channels in 25 kHz increments in the frequency range of 225.000 MHz to 399.975 MHz. Control of the transmitter frequency is accomplished by the SYNTH/ECCM slice in response to switch settings of the switching unit. The transmitter provides a minimum of 10 watts CW RF output power in all RT operating modes. Transmitting modes include AM voice, tone, and baseband data.
Wiring Harness p/n 565090-802	Remote RT internal wiring flex circuit. Provides electrical interconnection between all slices of remote RT for all control and data signals necessary for operation of the RT.
Control Unit C-11721/ARC-164(V)	Provides remote control of RT-1504 in all Have Quick II modified AN/MRC-107A and 106E-2A Communications Centrals (AN/URC-98 radio set).
Switching Unit SA-2525/ARC-164(V)	Front panel assembly of the control unit. Provides all switching and control functions for RT mode selection and operation. Contains the interface circuit card which converts all front panel control information to a serial data signal for use by the RT. Displays provide operator with visual indications of operating modes and frequency selections.
Control Adapter MX-9708/ARC-164(V)	The control adapter provides internal operating power for the control unit.
Wiring harness p/n 568628-801	Control unit internal wiring flex circuit. Provides electrical interconnection between the switching unit, control adapter and external connector.

Table 1-4. Equipment Supplied - CONT

Nomenclature/ common name	Description and purpose
Control Unit C-11816/URC-99	Provides remote control of RT-1504 in all Have Quick II modified AN/MRC-108() Communications Centrals (AN/URC-99 radio set).
Front Panel assembly p/n 818916-801	The front panel assembly contains all the front panel operator controls for RT mode selection and operation. Displays provide operator with visual indications of operating modes and frequency selections. Also interfaces the operator handsets to the UHF radio set.
Interface CCA p/n 816192-801	The interface circuit card converts all front panel control information to a serial data signal for use by the RT.
Power Supply CCA p/n 918837-801	The power supply circuit card provides internal operating power for the control unit.
Wiring harness p/n 420163-801	Control unit internal wiring which provides electrical interconnection between the above assemblies and the external connectors.
Mounting Base MT-6165/URC	Provides rainproof mounting and adapts the RT-1504/ARC-164 for RT-742/ARC-51BX radio set replacement.
Rubidium Oscillator p/n 626404-1	A precision 10 MHz oscillator to maintain a long-term, accurate time-of-day signal.
Divider/audio CCA p/n 811397-801	Divides 10 MHz oscillator signal down to 800 kHz for use by the RT. Monitors oscillator frequency and detects oscillator failure. Provides charging current for +18Vdc battery and switchover to battery operation during power interruptions. Also buffers the receive audio signal from the RT for application to the handsets and speaker amplifier.
DC/DC Converter p/n 535299-1	Generates a +28 Vdc regulated output from input voltages ranging from +18 to +32 Vdc.
Power Supply p/n 538667-802	Provides +6.2 and +12 Vdc operating power for internal mounting base circuitry.
+18 Vdc Battery p/n 810077-801	Provides operating power during momentary power interruptions (15 minutes maximum).

Table 1-5. Related Publications

Technical order	Subject
TO 12R2-2ARC164-X2	Intermediate Maintenance Instructions for Have Quick II AN/ARC-164(V)
TO 12R2-2ARC164-33-X	Supplemental Overhaul Instructions for Have Quick II AN/ARC-164(V)
TO 12R2-2ARC164-34-X	Supplemental Illustrated Parts Breakdown for Have Quick II AN/ARC-164(V)
TO 12R2-2ARC164-32	Intermediate Maintenance Instructions for AN/ARC-164(V) (Have Quick)
TO 12R2-2ARC164-33	Overhaul Instructions for AN/ARC-164(V) (Have Quick)
TO 12R2-2ARC164-34	Illustrated Parts Breakdown for AN/ARC-164(V) (Have Quick)
TO 12R2-2URC-102	Intermediate Maintenance Instructions for Have Quick II AN/URC-98/99
TO 12R2-2URC-103	Overhaul Instructions for Have Quick II AN/URC-98/99
TO 12R2-2URC-104	Illustrated Parts Breakdown for Have Quick II AN/URC-98/99
TO 31R2-2MRC107-2	Service and Circuit Diagrams for Communications Central AN/MRC-107A
TO 31R2-2MRC107-2-3	Service and Circuit Diagrams for Communications Central AN/MRC-107A with Have Quick Modification
TO 31R2-2MRC108-2	Service and Circuit Diagrams for Communications Central AN/MRC-108 and AN/MRC-108A
TO 31R2-2MRC108-2-2	Service and Circuit Diagrams for Communications Central AN/MRC-108/A/B with Have Quick Modification
KAO-168B/TSEC	Operation Instructions for COMSEC Equipment TSEC/KY-57/58
KAO-330A/TSEC	Operation Instructions for COMSEC Equipment KYK-13/TSEC

CHAPTER 2

OPERATION

Section I. CONTROLS AND INDICATORS

2-1 CONTROLS AND INDICATORS.

Operating controls and indicators of the C-11721/ARC-164(V) control are shown in figure 2-1 and described in table 2-1. Operating controls and indicators of the C-11816/URC-99 control are shown in figure 2-2 and described in table 2-2. Operating controls and indicators of the MT-6165/URC mounting base are shown in figure 2-3 and described in table 2-3.

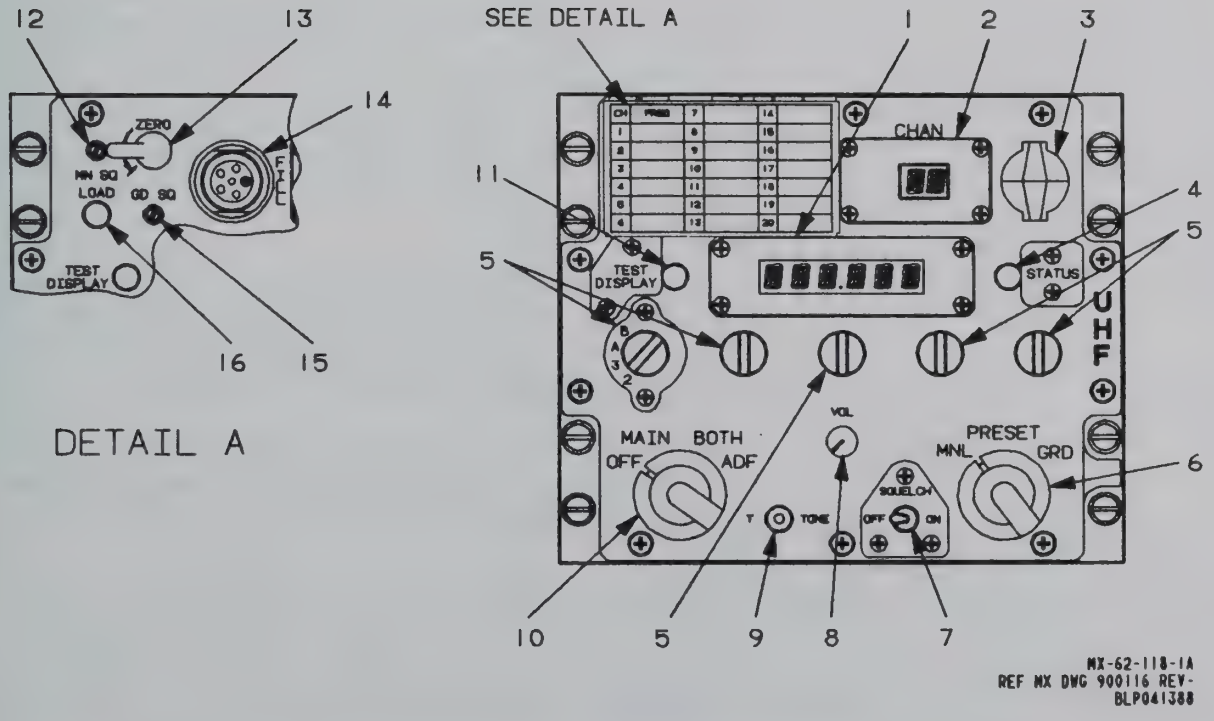

Figure 2-1. Operating Controls and Indicators for C-11721 Control Unit

Table 2-1. Operating Controls and Indicators for C-11721 Control Unit

Reference (Fig. 2-1)	Nomenclature	Function
1	Frequency/status (f/s) indicator	Displays the individual frequency switch settings or any of the following operator prompts; see fig. 2-4 for further explanation of display information: VER/OP - Indicates radio set is in normal operating mode. M-LOAD - Indicates radio set is in MWOD load mode. ERASE - Indicates radio set is in MWOD erase mode. FMT.CNG - Indicates radio set is in Frequency Management Training Change mode. FILL - Indicates a keyfill device is connected to the front panel FILL connector. WOD OK - Indicates a valid WOD was successfully received from the keyfill device. BAD - Indicates no WOD or a bad parity WOD was received from the keyfill device.
2	CHAN indicator	Displays selected channel when M-P-G switch is set to PRESET or displays selected memory location when radio set is in the MWOD load or FMT-change operating modes (see fig. 2-4 for further explanation of CHAN display).
3	CHAN switch	Selects desired preset channel (1-20) during preset operation. Also selects the desired memory locations when radio set is in the MWOD load mode (20-14,1) or FMT-change mode (20-5).
4	STATUS switch	When pressed, initiates an alternate display on the f/s and CHAN indicators for five seconds (see fig. 2-4 for further explanation of STATUS switch).
5	2-3-A/Frequency switches	These switches select the corresponding hundreds, tens, units, tenths, and thousandths digits (as shown on the f/s indicator) for the desired frequency in normal mode, and the desired WOD elements or net number for AJ mode. In addition, the A position puts the radio set into the AJ frequency-hopping mode of operation when selected.

Table 2-1. Operating Controls and Indicators for C-11721 Control Unit - CONT

Reference (Fig. 2-1)	Nomenclature	Function
6	MNL-PRESET-GRD (M-P-G) switch	Determines the method of frequency selection as follows: MNL - Frequency is manually selected using the five frequency switches. PRESET - Frequency is selected using CHAN switch. Along with LOAD switch, also used when programming the 20 preset channels. GRD - Automatically tunes the radio set main receiver and transmitter to the guard frequency (243.000 MHz) and disables the guard receiver.
7	SQUELCH ON-OFF switch	Enables and disables squelch (noise quieting) of radio set main receiver.
8	VOL control	Adjusts audio level.
9	T-TONE switch	This is a three position toggle switch (middle position normally off) with two of the positions being spring-loaded. When placed in the TONE position, transmits a 1020 Hz DF tone on the selected frequency and will stop when switch is released. If radio set TOD clock is started, the TONE position transmits the TOD message data followed by the DF tone. When placed in the T position, enables reception of TOD message for one minute. The T-TONE switch also initiates emergency TOD clock start, loads MWOD elements, erases MWOD elements and loads FMT-net operating frequencies when radio set is in the respective MWOD operating mode.
10	Function switch	Selects the overall radio set operating function (OFF-MAIN-BOTH-ADF) as follows: OFF - Shuts down the equipment. MAIN - Enables main receiver and transmitter. BOTH - Enables main receiver, transmitter and guard receiver. ADF - Presently not used in this configuration.

Table 2-1. Operating Controls and Indicators for C-11721 Control Unit - CONT

Reference (Fig. 2-1)	Nomenclature	Function
11	TEST DISPLAY switch	Lights all segments of the f/s and CHAN indicators when pressed. Also used with T-TONE switch for emergency clock start.
12	MN SQ * (main squelch)	Adjusts level of squelch (noise quieting) for main receiver.
13	ZERO switch	Erases all Multiple Word-Of-Day (MWOD) elements when pressed.
14	FILL connector	Interconnects a KYK-13/TSEC keyfill device to radio set for automatic loading of MWOD.
15	GD SQ * (guard squelch)	Adjusts level of squelch (noise quieting) for guard receiver.
16	LOAD switch	Loads frequency data displayed on the f/s indicator into preset channels 1-19 as selected by the CHAN switch. Preset channel 20 is reserved for loading MWOD operating mode data (220.0XX).

* Not operable on control unit front panels. Squelch adjustment is done from remote RT Data Converter slice.

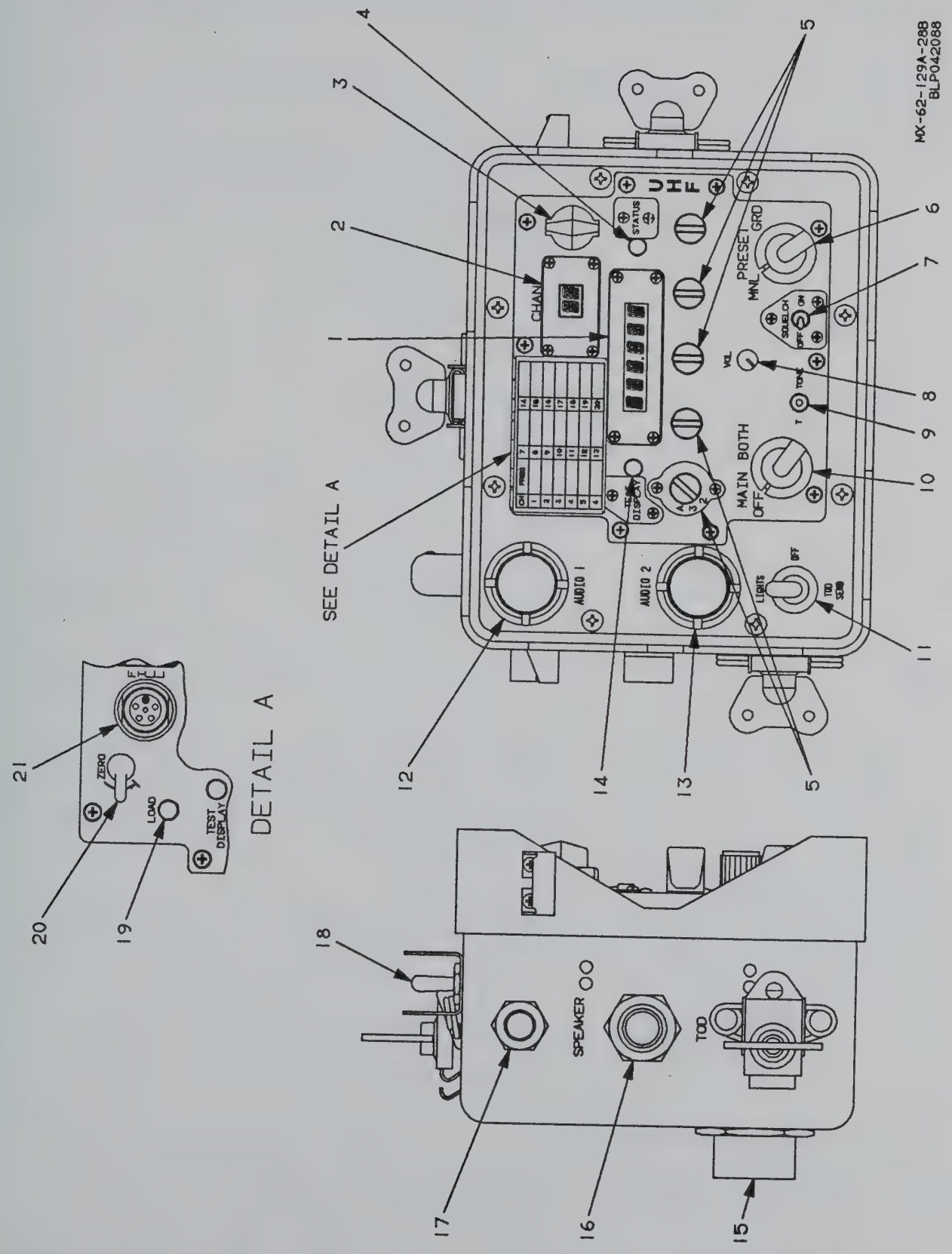

Figure 2-2. Operating Controls and Indicators for C-11816 Control Unit

Table 2-2. Operating Controls and Indicators for C-11816 Control Unit

Reference (Fig. 2-2)	Nomenclature	Function
1	Frequency/status (f/s) indicator	Displays the individual frequency switch settings or any of the following operator prompts; see fig. 2-4 for further explanation of display information: VER/OP - Indicates radio set is in normal operating mode. M-LOAD - Indicates radio set is in MWOD load mode. ERASE - Indicates radio set is in MWOD erase mode. FMT.CNG - Indicates radio set is in Frequency Management Training Change mode. FILL - Indicates a keyfill device is connected to the front panel FILL connector. WOD OK - Indicates a valid WOD was successfully received from the keyfill device. BAD - Indicates no WOD or a bad parity WOD was received from the keyfill device.
2	CHAN indicator	Displays selected channel when M-P-G switch is set to PRESET or displays selected memory location when radio set is in the MWOD load or FMT-change operating modes (see fig. 2-4 for further explanation of CHAN display).
3	CHAN switch	Selects desired preset channel (1-20) during preset operation. Also selects the desired memory locations when radio set is in the MWOD load mode (20-14,1) or FMT-change mode (20-5).
4	STATUS switch	When pressed, initiates an alternate display on the f/s and CHAN indicators for five seconds (see fig. 2-4 for further explanation of STATUS switch).
5	2-3-A/Frequency switches	These switches select the corresponding hundreds, tens, units, tenths, and thousandths digits (as shown on the f/s indicator) for the desired frequency in normal mode, and the desired WOD elements or net number for AJ mode. In addition, the A position puts the radio set into the AJ frequency-hopping mode of operation when selected.

Table 2-2. Operating Controls and Indicators for C-11816 Control Unit - CONT

Reference (Fig. 2-2)	Nomenclature	Function
6	MNL-PRESET-GRD (M-P-G) switch	Determines the method of frequency selection as follows: MNL - Frequency is manually selected using the five frequency switches. PRESET - Frequency is selected using CHAN switch. Along with LOAD switch, also used when programming the 20 preset channels. GRD - Automatically tunes the radio set main receiver and transmitter to the guard frequency (243.000 MHz) and disables the guard receiver.
7	SQUELCH ON-OFF switch	Enables and disables squelch (noise quieting) of radio set main receiver.
8	VOL control	Adjusts audio level in H-33F/PT handsets connected at AUDIO 1 and AUDIO 2 connectors.
9	T-TONE switch	This is a three position toggle switch (middle position normally off) with two of the positions being spring-loaded. When placed in the TONE position, transmits a 1020 Hz DF tone on the selected frequency and will stop when switch is released. If radio set TOD clock is started, the TONE position transmits the TOD message data followed by the DF tone. When placed in the T position, enables reception of TOD message for one minute. The T-TONE switch used in conjunction with TEST DISPLAY also initiates emergency TOD clock start, loads MWOD elements, erases MWOD elements and loads FMT-net operating frequencies when radio set is in the respective MWOD operating mode.
10	Function switch	Selects the overall radio set operating function (OFF-MAIN-BOTH) as follows: OFF - Shuts down the equipment. MAIN - Enables main receiver and transmitter. BOTH - Enables main receiver, transmitter and guard receiver.

Table 2-2. Operating Controls and Indicators for C-11816 Control Unit - CONT

Reference (Fig. 2-2)	Nomenclature	Function
11	LIGHTS-OFF-TOD SEND switch	In LIGHTS position, illuminates the font panel lighting. In TOD SEND position, enables radio set to send a hardwire TOD signal.
12 & 13	AUDIO 1/AUDIO 2 Connectors	Connects two H-33F/PT handsets or the AN/GRA-6 Control Group to the UHF radio set.
14	TEST DISPLAY switch	Lights all segments of the f/s and CHAN indicators when pressed. Also used with T-TONE switch for emergency clock start.
15	Signal/Power connector J1	Connection point for radio set signal/power cables.
16	TOD connector J3	Connects an external time-of-day source to radio set for hardwire TOD transfers.
17	SPEAKER connector J2	Connects DC power and audio signals to External Speaker/Amplifier 76F-3.
18	KEEP ALIVE switch	Connects power (both external jeep and internal batteries) to the radio set keep-alive circuits to prevent loss of TOD during powr interruptions.
19	LOAD switch	Loads frequency data displayed on the f/s indicator into preset channels 1-19 as selected by the CHAN switch. Preset channel 20 is reserved for loading MWOD operating mode data (220.0XX).
20	ZERO switch	Erases all Multiple Word-Of-Day (MWOD) elements when pressed.
21	FILL connector	Interconnects a KYK-13/TSEC keyfill device to radio set for automatic loading of MWOD.

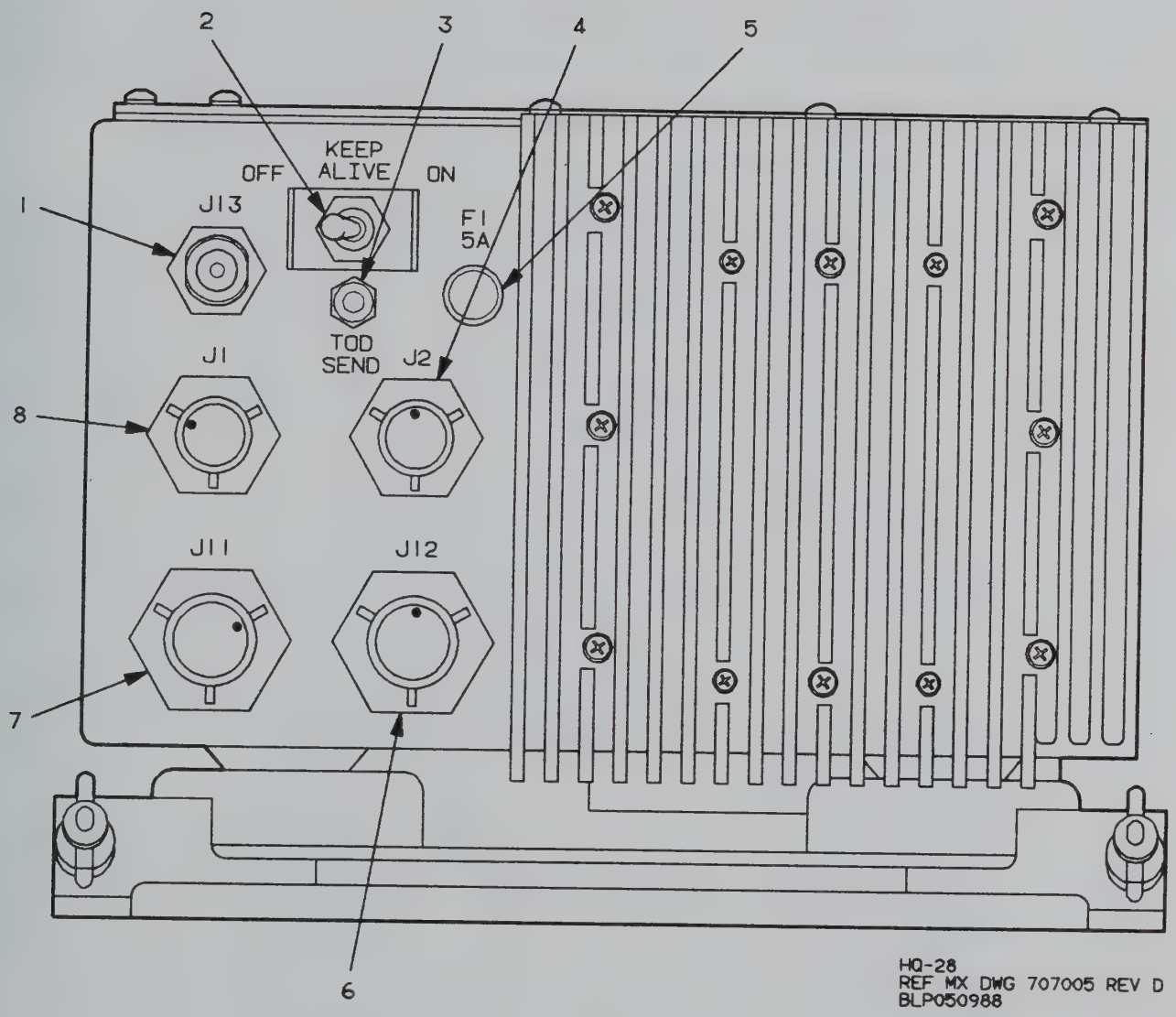

Figure 2-3. Operating Controls for MT-6165 Mounting Base

Table 2-3. Operating Controls for MT-6165 Mounting Base

Reference (Fig. 2-3)	Nomenclature	Function
1	Antenna Connector J13	Connects UHF antenna cable to radio set.
2	KEEP ALIVE ON-OFF switch	Connects power (both external jeep and internal batteries) to the radio set keep-alive circuits to prevent loss of TOD during power interruptions. **NOTE** This KEEP ALIVE switch is not used in the URC-99 radio set and should always be in the OFF position. Keep alive operation for the URC-99 radio set is accomplished using the KEEP ALIVE switch on the C-11816 control. If it is necessary to shut down radio set primary power for an extended period of time, set the switch to the OFF position to prevent drainage of the vehicle's battery.
3	TOD Send switch	Initiates a hardwire TOD transfer when pressed.
4	Keep Alive power connector J2	Connects cable from vehicle battery/external generator power source to maintain radio set operation when normal operating power is lost.
5	Fuse F1 5A	A five ampere fuse which limits the current drain of the internal circuitry of the mounting base.
6 & 7	Signal/Power connectors J11/J12	Connection point for radio set signal/power cables.
8	Time-of-Day Connector J1	Connects an external time-of-day source to radio set for hardwire TOD transfers.

CONDITION							MAIN DISPLAY		CHANNEL DISPLAY	
							NORMAL	STATUS	NORMAL	STATUS
RADIO OFF							[blank]	[blank]	[blank]	[blank]
RADIO ON	DISPLAY TEST ON OR POWER UP						⊠⊠⊠.⊠⊠⊠	⊠⊠⊠.⊠⊠⊠	⊠⊠	⊠⊠
	DISPLAY TEST OFF & NOT POWERUP	RADIO UNDER REMOTE CONTROL					REM OTE	REM OTE	[blank]	[blank]
		RADIO UNDER LOCAL CONTROL	FILL DEVICE ON	WOD REQUESTED OR NO WODS RECEIVED			FI LL	[freq sw.]	[chan]	[chan]
				BAD PARITY WOD RECEIVED			BA D			
				GOOD PARITY WOD RECEIVED & PASSED TO SYNTHESIZER			WOD OK			
			FILL DEVICE NOT ON	PRESET 20 = 220.050 OR ERASE SWITCH ROTATED			ERA SE			
				PRESET 20 = 220.025			M-L OAD			
				PRESET 20 = 220.275			FMT.CHG			
				PRESET 20 ≠ 220.025 .050 .075	MPG ≠ PRESET		[freq sw.]	[tuning freq or net]	[blank]	[chan]
					MPG = PRESET	FREQ SW. ≠ 2xx. xxx 3xx. xxx OR CHANNEL ≠ 20 OR PRESET 20 ≠ 220. 000			[chan]	
						FREQ SW. = 2xx. xxx 3xx. xxx & CHANNEL = 20. & PRESET 20 = 220. 000		VER /OP		

NOTE: THE TERM [freq sw.] MEANS DISPLAY READS THE SAME AS POSITIONS OF FREQUENCY SELECTORS.
THE TERM [blank] MEANS ALL SEGMENTS ARE NOT LIT.
THE TERM [CHAN] MEANS DISPLAY READS THE SAME AS PRESET NUMBER SELECTED BY PRESET SELECTOR.
THE SYMBOL ≠ MEANS "NOT EQUAL TO".
⊠⊠⊠.⊠⊠⊠ AND ⊠⊠ MEANS ALL SEGMENTS ARE LIT.
INFORMATION SHOWN IN STATUS COLUMNS WILL BE DISPLAYED FOR A MINIMUM OF 5 SECONDS AFTER PRESSING STATUS SWITCH.

MX-62-118-28
BLP040288

Figure 2-4. Radio Set Display Operation

Section II. NORMAL MODE OPERATION INSTRUCTIONS

2-2 NORMAL MODE OPERATING PROCEDURES.

This section provides normal mode (non-AJ mode) operating procedures for the HAVE QUICK II AN/URC-98/99 radio set. Included are procedures for turn-on of the equipment, loading of preset channels, and normal two-way communications. For AJ mode operating procedures, refer to Section III, paragraph 2-11.

2-3 TURN-ON.

a. Rotate the function switch to the MAIN position. All segments of both displays will light momentarily on power-up. After power-up, if the frequency/status (f/s) indicator displays a frequency, proceed to step b. If M-LOAD, FMT.CNG or ERASE is displayed, proceed as follows:

(1) Use the CHAN switch to select channel 20.

(2) Use the frequency switches to select 220.000 on the f/s indicator.

(3) Rotate the M-P-G switch to PRESET.

(4) Lift the access cover assembly (detail A, figure 2-1) and press the LOAD pushbutton. The radio set is now in the verify/operate mode.

(5) Set M-P-G switch to MNL.

b. Set the SQUELCH switch to OFF. A rushing noise will be heard in the handset. Adjust the VOL control for the desired listening level. If external speaker operation is desired, adjust the SPEAKER VOLUME control on Speaker/Amplifier 76F-3 to the desired listening level.

c. Set the SQUELCH switch to ON.

d. To transmit, press the push-to-talk switch and talk normally into the microphone. Verify that sidetone is present in the handset. Release the push-to-talk switch to listen.

2-4 MANUAL FREQUENCY SELECTION.

a. Rotate the M-P-G switch to MNL.

b. Use the frequency switches to select the desired operating frequency as shown on the f/s indicator.

2-5 PRESET CHANNEL SELECTION.

a. Rotate the M-P-G switch to PRESET.

b. Use the CHAN switch to select the desired operating channel (1-19).

NOTE

Channel 20 is reserved for loading single WODs and MWOD operating mode data. To see what frequency is loaded in the selected channel, press the STATUS switch. The frequency is displayed on the f/s indicator for five seconds.

2-6 PRESET CHANNEL LOADING.

a. Rotate the M-P-G switch to PRESET.

b. Use the frequency switches to select the desired operating frequency.

c. Rotate the CHAN switch to the desired channel number 1-19. Do not select channel 20. Channel 20 is reserved for loading single WODs and MWOD operating mode data.

d. Press and release the LOAD pushbutton.

e. Use a soft lead (erasable) pencil and record the selected frequency for the displayed preset channel on the channel frequency chart.

f. Repeat steps b through e to load additional preset channels.

g. Close the access cover when all preset channels have been loaded.

2-7 GUARD CHANNEL MONITORING.

To monitor the guard frequency (243.000 MHz) in addition to your operating frequency, rotate the function switch to BOTH.

2-8 GUARD FREQUENCY SELECTION.

To operate the radio set on the guard frequency only, rotate the M-P-G switch to GRD. The main receiver and transmitter are now tuned to 243.000 MHz.

2-9 DF TONE TRANSMISSION.

To transmit a 1020 Hz DF tone, select the desired operating frequency or channel and set the T-TONE switch to the TONE position. The radio set will stop transmitting when the T-TONE switch is released.

2-10 SECURE VOICE OPERATION.

The radio set is capable of secure voice operation in the normal mode with the TSEC/KY-28, TSEC/KY-57 or TSEC/KY-58 COMSEC equipments. For secure voice operation, obtain from the COMSEC custodian the proper COMSEC equipment and proper variables. After following the radio set's turn-on procedure, refer to the applicable technical manual (see table 1-5) for operation of the associated COMSEC equipment.

Section III. ANTI-JAMMING (AJ) MODE OPERATION INSTRUCTIONS

2-11 AJ MODE OPERATING PROCEDURES.

The AJ mode programs the radio set with a frequency-hopping pattern and rate to provide the capability for jam-resistant communications. Three inputs are needed for entering AJ mode: time-of-day (TOD), word-of-day (WOD) and the net number. Included in subsequent paragraphs are procedures for receiving and sending TOD, procedures for loading WOD and specific procedures for operating in the AJ mode.

2-12 TURN-ON.

a. Turn on the radio set in accordance with paragraph 2-3.

b. Set the KEEP ALIVE switch to ON (Located on MT-6165 mounting base for URC-98 radio set or on the C-11816 control for the URC-99 radio set).

c. Load WOD. WOD can be loaded manually using the MWOD loading method (para. 2-20) or the single WOD loading method (para. 2-25). WOD can also be loaded electronically using a KYK-13/TSEC keyfill device (para. 2-21).

d. Receive TOD in accordance with paragraph 2-13. If TOD is not available from a coordinated universal timing (UTC) source (Time Signal Set AN/TRC-177 or AN/TRC-187) or from any other source within your operating network, perform a TOD emergency clock start in accordance with paragraph 2-16.

e. Enter the net number in accordance with paragraph 2-29. The radio set is now in AJ mode and can communicate with other similarly equipped radio sets that have the same WOD, TOD and net number.

NOTE

A steady warning tone is heard in the handset when the AJ mode is selected and TOD or a valid WOD has not been entered. A pulsating warning tone is heard in the handset when an invalid operating net is selected.

2-13 TOD RECEIVE.

NOTE

On initial power-up, the radio set automatically accepts the first TOD message it receives. Subsequent TOD transmissions are ignored.

a. Use the frequency switches in the manual mode or the CHAN switch in the preset mode to select a predesignated frequency for TOD transmission.

b. Momentarily select the T position on the T-TONE switch and then release.

c. Request TOD from another station in your network.

NOTE

If time is being automatically beaconed, the first TOD message received within one minute of selecting the T position will be accepted.

2-14 TOD UPDATE.

Slightly garbled but otherwise acceptable communications during AJ operation is an indication of drift in TOD synchronization. To resynchronize the radio sets, a TOD update can be performed while still in the AJ mode as follows:

a. Select the T position on the T-TONE switch for 1 second and then release.

b. Request TOD from another station on your operating network.

2-15 TOD SEND.

a. Use the frequency switches in the manual mode or the CHAN switch in the PRESET mode to select a predesignated frequency (normal mode) or net number (AJ mode for a TOD update).

b. Set the T-TONE switch to TONE position momentarily.

2-16 TOD EMERGENCY CLOCK START.

NOTE

If the WOD you intend to operate on was loaded single WOD method (presets 20-15), it is not necessary to load an operational date; proceed to step b.

a. Load an operational date as follows:

NOTE

The operational date is the current (GMT) day-of-month and must be entered so the radio set can select one of the MWODs for code generator initialization.

(1) Enter MWOD loading mode in accordance with paragraph 2-19.

(2) Set CHAN switch to 1.

(3) Use the frequency switches to select the operational date in the format XAB.XXX, where AB equals the day-of-month (01-31) and X equals don't care.

(4) Set T-TONE switch to the TONE position, then release. The operational date is now entered.

(5) Enter verify/operate mode in accordance with paragraph 2-19.

b. Set the T-TONE switch to the T position while simultaneously pressing the TEST DISPLAY switch, then release.

NOTE

This new TOD is arbitrary and will not be synchronized to UTC time. The radio set will not communicate with any other ECCM-equipped radio sets in the AJ mode unless this new TOD is transmitted to the other radio sets.

2-17 TOD TRANSFER VIA HARDWIRE LINK.

The radio set has the capability to transfer TOD messages via hardwire cable connections as well as via UHF rf link. Procedures are provided to perform hardwire TOD transfers between the radio set and a Radio Frequency Oscillator O-1800(V)2/TRC (RFO) and between two separate communications centrals (radio set to radio set).

2-17.1 RFO to Radio Set Hardwire TOD Transfer. The RFO is the precision oscillator and back-up TOD clock element of the AN/TRC-177() or AN/TRC-187 Time Signal Set. If desired, the RFO can be disconnected from the Time Signal Set and carried out to the communications central to perform a hardwire TOD transfer as follows:

NOTE

The RFO internal battery can maintain RFO operation for approximately 15 minutes when disconnected from the Time Signal Set.

a. Use the RFO interface cable, part number 565405-802, and connect the RFO (J1 RSG connector) to connector J1 on the MT-6165 mounting base (URC-98 radio set) or to J3 on the C-11816 control TOD connector (URC-99 radio set).

b. Momentarily select the T position on the T-TONE switch.

c. Press the RFO SEND TOD switch.

2-17.2 Radio Set to RFO Hardwire TOD Transfer.

a. Use the RFO interface cable, part number 565405-802, and connect the RFO (J1 RSG connector) to connector J1 on the MT-6165 mounting base (URC-98 radio set) or to J3 on the C-11816 control TOD connector (URC-99 radio set).

b. Press the RFO RCV TOD switch. The SET CLOCK indicator should light.

c. Press the TOD SEND switch on the MT-6165 mounting base (URC-98 radio set) or set the LIGHTS/TOD SEND switch on the C-11816 control to TOD SEND (URC-99 radio set). The RFO SET CLOCK incicator should go out.

2-17.3 Radio Set to Radio Set Hardwire TOD Transfer. The cable required to make the hardwire TOD connections between communications centrals is not supplied with the radio set and must be fabricated. If this capability is desired, refer to the Intermediate Maintenance Instructions manual, TO 12R2-2URC-XX2, for the cable fabrication information. Perform a hardwire TOD transfer as follows:

a. Connect the fabricated cable between the J1 connectors on the MT-6165 mounting base (URC-98 radio sets) or between the C-11816 control TOD connectors (URC-99 radio sets) or between either radio set.

b. On the receiving radio set, momentarily select the T position on the T-TONE switch.

c. On the sending radio set, press the TOD SEND switch on the MT-6165 mounting base (URC-98 radio set) or set the LIGHTS/TOD SEND switch on the C-11816 control to TOD SEND (URC-99 radio set).

2-18 TOD KEEP ALIVE OPERATION.

The KEEP ALIVE switch connects back-up dc power (from the vehicle battery through a keep-alive power cable and from the 18 Vdc battery within the MT-6165 mounting base) to the radio set TOD time-keeping circuitry to prevent loss of TOD during power interruptions. The KEEP ALIVE switch also connects dc charging current to the internal 18 Vdc battery. Keep alive operation is accomplished in the URC-98 radio set using the KEEP ALIVE switch on the MT-6165 mounting base and in the URC-99 radio set using the KEEP ALIVE switch on the C-11816 control.

NOTE

The KEEP ALIVE switch on the MT-6165 mounting base is not used in the URC-99 radio set configuration (AN/MRC-108() Communications Central) and should always be in the OFF position.

If it is necessary to shut down radio set primary power for an extended period of time, set the KEEP ALIVE switch to the OFF position to prevent deep discharge of the vehicle's battery.

2-19 MWOD OPERATING MODES SELECTION.

Four operating modes are used within the radio set to initiate various MWOD programming functions. Table 2-4 lists the four modes and the displays applicable to each mode. After the radio set has been turned on, proceed as follows to enter any of these modes.

Table 2-4. MWOD Functions and Displays

Code number	Display	Function
220.000	VER/OP	Verify/Operate
220.025	M-LOAD	MWOD Load
220.050	ERASE	MWOD Erase
220.075	FMT.CNG	Frequency Management Training Change

a. Set the CHAN switch to 20.

b. Rotate the M-P-G switch to PRESET.

c. Use the frequency switches to select the applicable code number (220.0XX) from table 2-4 for the desired operating mode.

d. After lifting the front panel access cover, press and release the LOAD pushbutton.

e. The radio set is now in the selected mode. For the MWOD load, MWOD erase or FMT-change modes, the operating mode is displayed on the f/s indicator. For verify/operate mode, press the STATUS switch and VER/OP is displayed on the f/s indicator for five seconds.

f. Rotate the M-P-G switch to MNL.

2-20 MWOD LOADING USING MANUAL METHOD.

MWOD capability allows for up to six WODs to be loaded at one time. Each WOD contains a unique date code which is entered in memory location 14. When the current operational date is updated in the radio set at midnight transitions, the code generator automatically reinitializes with a new WOD having the same date. Proceed as follows to perform manual MWOD loading:

NOTE

In the following steps, if the frequency switches are not used within five seconds, the f/s indicator reverts to the M-LOAD display. To review the frequency switch settings, press the STATUS switch.

a. Enter M-LOAD mode in accordance with paragraph 2-19. Ensure M-P-G switch is set to MNL.

b. Set CHAN switch to memory location 20. Use five frequency switches to select first WOD element.

c. Set T-TONE switch to the TONE position, then release. Note a single beep. The first WOD element is entered.

d. Select next lower memory location with CHAN switch.

NOTE

All remaining WOD elements may be loaded by repeating steps b through d. A single beep will be heard when the T-TONE switch is set to the TONE position when loading WOD elements.

e. Use CHAN switch to select location 14.

NOTE

If two or more WODs loaded have the same date code, the radio recognizes only the latest one entered.

f. Select the applicable date code using the frequency switches.

NOTE

Date code entry for the WOD is represented by the format XAB.XXX, where AB equals the day-of-month (01-31) and X equals don't care.

g. Set the T-TONE switch to the TONE position and release. Note a double beep. One complete WOD is now entered. To load more WODs, reselect location 20 and repeat steps b through g.

NOTE

If the radio set is switched off or power is lost after entry of MWODs, the data is not lost. All MWOD data remains in force until physically changed.

2-21 MWOD LOADING USING A KYK-13/TSEC KEYFILL DEVICE.

The KYK-13/TSEC keyfill device shown in figure 2-5 is used to load MWOD electronically since the manual method is prone to human error. MWOD keying material is supplied through cryptologic channels in the form of punched paper tape as well as in printed form. The KOI-18/TSEC punched paper tape reader is used to load the KYK-13. Load the KYK-13 in accordance with instructions in operator's manual KAO-330A/TSEC. Load the radio set using the KYK-13 as follows:

a. Turn on the radio set in accordance with turn-on procedures.

b. Lift the front panel access cover to reveal the FILL connector.

NOTE

The fill cable for the KYK-13 may be used while loading MWOD information into the RT, but is not required. If used, it may be necessary to lubricate the fill cable connector O-ring for ease of installation.

c. Set the KYK-13 mode switch to OFF/CHECK.

d. Install the KYK-13 fill cable on the FILL connector.

e. Set the KYK-13 mode switch to ON. Observe f/s indicator displays FILL.

f. Set the KYK-13 address switch to the applicable channel (1-6).

g. Press radio set LOAD switch. Note a series of beeps are heard and f/s indicator displays WOD OK.

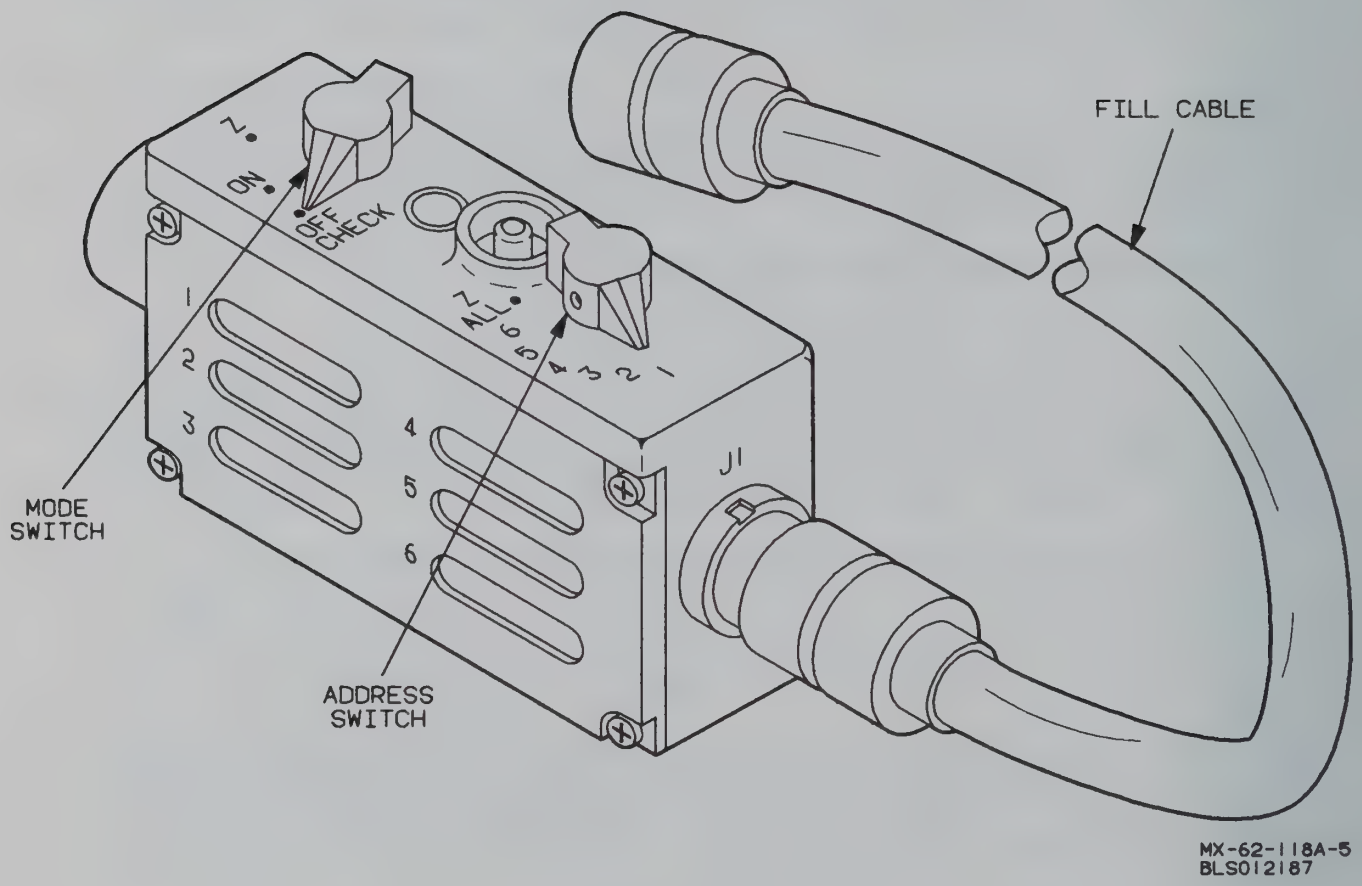

Figure 2-5. KYK-13/TSEC Keyfill Device With Fill Cable

NOTE

If the f/s indicator displays BAD, the KYK-13 must be reloaded and the procedures repeated.

The CHAN indicator steps down from memory location 20 to 14, then displays memory location one while the KYK-13 is connected and turned on. This allows entry of operational date information, if required. The operational date must match date code of one of the WODs being loaded with KYK-13 fill device.

h. Set the KYK-13 address switch to the next applicable channel and repeat step g. Observe that WOD OK is displayed on the f/s indicator after each WOD is loaded.

i. If desired, load operational date by pressing STATUS switch, then select the date on the frequency switches in the format XAB.XXX (where AB = 01 - 31 for day-of-month and X = don't care). Momentarily set the T-TONE switch to the TONE position then release.

j. Set the KYK-13 mode switch to OFF/CHECK.

k. Unplug the fill cable and close the access cover. The radio set returns to its previous mode and both displays return to previous settings.

2-22 MWOD ERASE.

The erase mode is used to clear the memory of all MWOD elements. To accomplish MWOD erasure, proceed as follows:

a. Enter ERASE mode in accordance with paragraph 2-19.

b. Momentarily set the T-TONE switch to the TONE position. ERASE is displayed on f/s indicator. All MWODs are now erased.

c. Enter verify/operate mode in accordance with paragraph 2-19.

2-23 MWOD ERASE - ALTERNATE METHOD.

An alternate and quicker method of erasing MWODs is as follows:

a. Lift the front panel access cover to reveal the ZERO switch.

b. Press the ZERO switch down, then return to normal position. All MWODs are now erased.

c. Close front panel access cover.

2-24 MWOD DATE CODE VERIFY.

The verify/operate mode serves a dual function. It is used to enter the normal or AJ operating modes, and is also used to verify which days' WODs are loaded in the radio set. To enter the verify/operate mode for normal or AJ mode operation, enter the verify/operate mode in accordance with paragraph 2-19. To verify MWOD date codes, proceed as follows:

a. Enter verify/operate mode in accordance with paragraph 2-19.

b. Use the tens (10) and units (01) frequency switches to select the MWOD date to be verified.

c. Using the CHAN switch, select 20, then 19, and then 20 again. Listen for a single beep in the handset. A single beep verifies that an MWOD with a matching date code is stored in memory. If a single beep is not heard, the date code selected is not stored in memory.

d. Repeat steps b and c until all desired date codes have been verified.

2-25 SINGLE WOD LOADING.

During the transition from single to multiple WOD operation, the single WOD loading method is still available. Using this method, the WOD elements are entered into preset channels 20 through 15. The WOD may vary in length and may require anywhere from one to all six of these channels, starting with channel 20 and working backward to 15. To use the single WOD method, proceed as follows:

a. Rotate the M-P-G switch to PRESET.

b. Use the CHAN switch to select channel 20.

c. Use the frequency switches to select the WOD element.

d. Lift the access cover assembly and press the LOAD switch.

e. Use the CHAN switch to select the next lower channel.

f. Repeat steps c through e until all WOD elements are loaded.

NOTE

The following step is done automatically by the radio set immediately after power-up if a WOD is loaded using this method.

g. Initialize the radio set by first using the CHAN switch; listen for a single beep in the handset. Then progressively select the next lower channel until a double beep is heard. A double beep indicates all WOD elements are transferred from the switching unit memory to the non-volatile synthesizer/ECCM memory in the RT.

h. Set the M-P-G switch to MNL.

2-26 FREQUENCY MANAGEMENT TRAINING CHANGE (FMT-CHANGE) MODE.

To change any or all of the sixteen frequency management training net frequencies, proceed as follows:

a. Enter the FMT-change mode in accordance with paragraph 2-19.

b. Use the CHAN switch to select the appropriate memory location (20 - 5).

c. Use the frequency switches to select the first frequency change.

NOTE

If the frequency switches are not used within five seconds, the f/s indicator reverts to displaying the current operating mode (FMT.CNG).

d. Set the T-TONE switch to the TONE position, then release.

e. Repeat steps b through d until all frequency changes are loaded.

f. Enter verify/operate mode in accordance with paragraph 2-19.

2-27 WOD ELEMENTS FOR TRAINING/MAINTENANCE.

For training and/or maintenance, use the WOD assigned by your operating command. If unassigned, use the following WOD elements with the corresponding memory locations. The WOD may be loaded either single or MWOD method.

Location	WOD Element
20	300.050
19	376.000
18	359.100
17	314.300
16	297.600
15	287.400
14	Date Code (MWOD method only)

2-28 CONFERENCING CAPABILITY.

In the AJ mode, the radio set can receive and process two simultaneous transmissions on the same operating net (conferencing) without the beat frequency interference that normally results. (Three simultaneous transmissions result in garbled reception.) This is accomplished by automatically offsetting the second transmitter frequency to the next lower channel (-25 kHz) when it monitors a transmission on the primary frequency. Reception is possible due to the wideband characteristics of the radio set receiver. In the Have Quick II radio set, this conferencing feature is enabled or disabled by the last two digits of the WOD element loaded in memory location 19. If the WOD element ends with 00 or 50, conferencing is enabled. If the WOD element ends with 25 or 75, conferencing is disabled.

NOTE

When operating in the secure voice mode, conferencing is automatically disabled.

If operating in the AJ mode on a single element WOD (memory location 20 only), conferencing is enabled by default.

For FMT-net training mode operation, conferencing is always enabled.

2-29 NET NUMBERS.

The net number programs the entry point in the AJ mode frequency hopping pattern. This enables multiple radio pairs to operate simultaneously on a non-interfering basis using a common WOD and TOD. The A position on the 2-3-A switch overrides the hundreds digit in both the manual and preset modes, puts the radio set in the AJ mode, and programs the radio set to use the net number inserted following the A. Select your operating net number as follows:

a. If the M-P-G switch is set to MNL, set the frequency switches to the desired net number.

b. If the M-P-G switch is set to PRESET, set the CHAN switch to a preset containing the desired net number. (Press the STATUS switch to view the digits.)

NOTE

The A cannot be stored in preset channel memory. If loading of a net number (AXX.XXX) into a preset channel is attempted, the A is accepted as a three. A preset channel frequency can be used as an AJ mode net number if the five digits after the hundreds position are the same as the desired net number.

c. Set the 2-3-A switch to A.

NOTE

A steady warning tone will be heard in the handset when the AJ mode is selected and TOD, or a valid WOD is not entered. A pulsating warning tone is heard in the handset when an invalid operating net is selected.

2-29.1 Full-up Net Numbers. The net number begins with an "A" and is followed by three digits "000" to "999". The last two digits of the display (00, 25, 50, 75) designate the frequency table being used. This permits 1000 possible net numbers for each frequency table. Net numbers ending in "00" select the original A-net and B-net frequency table. Net numbers ending in "25" select the new NATO/Europe frequency table and net numbers ending in "50" select the new non-NATO/Europe frequency table. Net numbers ending in "75" are reserved for future use at this time and will generate an invalid net alarm (pulsating warning tone).

2-29.2 Training Net Numbers. The valid T-net and FMT-net training mode net numbers are designated as listed below. Selecting any other net number while operating on a training mode WOD generates the invalid net alarm. As shown below, a net number ending with 00 selects the T-net training mode. In this mode, the radio set hops between the five frequencies loaded in with the WOD (locations 19 - 15). A net number ending in 25 selects the FMT-net training mode. In this mode, the radio set hops between the sixteen FMT-net training frequencies. To change any or all of the sixteen FMT-net frequencies, refer to paragraph 2-26.

T-Net Numbers	FMT-Net Numbers		
A00000	A00025	A00525	A01025
A00100	A00125	A00625	A01125
A00200	A00225	A00725	A01225
A00300	A00325	A00825	A01325
A00400	A00425	A00925	A01425
			A01525

2-30 GUARD OPERATION.

Guard receiver operation is not affected while operating in the AJ mode. The guard frequency may be monitored regardless of what mode the radio set is in as long as the function switch is in the BOTH position. Selecting GRD on the M-P-G switch disables the AJ mode, tunes the main receiver/transmitter to the guard frequency of 243.000 MHz, and disables the guard receiver.

2-31 SECURE VOICE OPERATION.

Secure voice operation in the AJ mode is the same as in normal mode except AJ secure voice operation is not possible with the TSEC/KY-28 COMSEC equipment.

SECTION IV. EMERGENCY OPERATION INSTRUCTIONS

2-32 EMERGENCY OPERATING PROCEDURES.

Included in this section are procedures for eliminating jamming conditions that may be encountered while operating in the normal mode. There is also one condition where the radio set may encounter jamming while in the AJ mode. The following procedure will alleviate that condition as well.

2-33 JAMMING CONDITIONS WHEN IN NORMAL MODE.

Proceed as follows to counter a jamming condition when in the normal mode. Set the 2-3-A switch to A and select the assigned net number if the radio set has been primed with WOD and TOD prior to the mission, otherwise perform the AJ mode turn-on procedures as outlined in paragraph 2-12. After all stations have entered the AJ mode with the same WOD, TOD and net number, jam-resistant communications are possible.

2-34 JAMMING CONDITIONS WHEN IN AJ MODE.

The only situation where jamming may occur in the AJ mode is when operating in the BOTH position of the function switch (jamming on guard frequency with guard receiver enabled). To counter this condition, set the function switch to MAIN.

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